

# 7200

Addendum/Errata

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## *Ventilatory System*

Part No. 4-023576-00

Rev. A

April 1998

Federal law (U.S.) restricts the sale of this device to, or by the order of, any physician.

 **NELLCOR PURITAN BENNETT™**  
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## Copyright Information

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## Comments

We're interested in what you think about the accuracy and usefulness of this publication and the 7200 Series Ventilatory System Operator's Manual. To ensure that you and future users have the highest quality manuals, or to communicate any issues you might have with the operation of the ventilator, please send your comments to:

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**The following 7200 Series Ventilator Operator's Manuals are affected by this errata:**

ENGLISH	Part Number 4-022300-00 Rev A (09-90)
GERMAN	Part Number 4-022314-00 Rev C (10-93)
SPANISH	Part Number 4-022315-00 Rev B (01-94)
ITALIAN	Part Number 4-022316-00 Rev C (01-94)
FRENCH	Part Number 4-022317-00 Rev C (01-94)

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## **Manufacturer:**

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**USA**

## **Emissions Compliance (applicable ONLY to those 7200 Series Ventilators bearing the CE label affixed to the rear panel):**

The 7200 Ventilator meets the criteria for EN55011 Emissions Classification, CISPR II, Group I, Class B.

### **Electromagnetic Interference (EMI)**

The 7200 Ventilator System complies with the requirements of IEC 601-1-2 (EMC Collateral Standard), including the E-field susceptibility requirements at a level of 3 V per meter, at frequencies from 26 MHz to 1 GHz, and the ESD requirements of this standard.

The 7200 has been tested and found to comply with the limits for medical devices to the EN60601-1-2:1993, EN60601-1-2:1194, Medical Device Directive 93/42/EEC. These limits are designed to provide reasonable protection against harmful EMI in a typical medical installation. In addition, the device contains alarms which notify the user when EMI is detected (although detection cannot be assured in all cases).

Because of the proliferation of radio-frequency transmitting equipment and other sources of electrical noise in the healthcare environment (for example, cellular phones, mobile two-way radios, electrical appliances), it is possible that high levels of EMI due to close proximity or strength of source may result in disruption of performance of the 7200 Ventilator.

The 7200 generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with these instructions may cause harmful interference with other devices in the vicinity.

Disruption may be evidenced by erratic readings, cessation of operation, or incorrect functioning of other devices. If this occurs, the site of use should be surveyed to determine the source of this disruption. The following actions may be taken to eliminate the source:

- Turn equipment in the vicinity off and on to isolate the source of interference.
- Reorient or relocate the 7200.
- Increase the distance between the 7200 and the other equipment.
- Select alternative power receptacle (ac power outlet).

If further assistance is required, contact Nellcor Puritan Bennett's Technical Services Department, or your local Nellcor Puritan Bennett Representative.

## **Biocompatibility**

Data compiled from analysis of 7200 field data collected through servicing and investigation of nonconforming components between January 1991 and December 1996, indicate no toxicity or biocompatibility issues with the materials within the 7200 Series Ventilator used to deliver gas and/or to monitor patient conditions.

## **Environmental Protection**

Nellcor Puritan Bennett recommends that customers or technical services personnel follow local governing ordinances and recycling instructions regarding disposal or recycling of the battery or other device components.

## European Standards Compliance

The following statement is applicable only to 7200 Series Ventilators bearing a CE label affixed to the rear panel.



The application to the ventilator of a label bearing this symbol signifies that the 7200 Ventilator complies with the requirements of IEC 601-1-2, (EMC Collateral Standard), including the E-field susceptibility requirements at a level of 3 V per meter, at frequencies from 26 MHz to 1 GHz, and the ESD requirements of this standard. However, even at this level of device immunity, certain transmitting devices (cellular phones, walkie-talkies, cordless phones, paging instruments, etc.) emit radio frequencies which could interrupt ventilator operation if located too close to the ventilator. It is difficult to determine when the field strength of these devices becomes excessive.

*Practitioners should be aware that radio frequency emissions are additive, and that the ventilator must be located a sufficient distance from transmitting devices to avoid interruption. Do not operate the ventilator in a magnetic imaging (MRI) environment. Section 3 describes possible ventilator alarms and what to do if they occur. Consult with your institutions's biomedical engineering department in case of interrupted ventilator operation, and before relocating any life support equipment.*

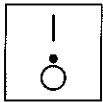
Where this symbol is present on the 7200 Series Ventilator, it signifies that the ventilator complies with the requirements of Medical Device Directive 93/42/EEC and with the requirements of Council Directive 89/336/EEC relating to Electromagnetic compatibility.

Where the CE symbol is not present on the ventilator, the statements appearing on this page relating to compliance with the requirements of IEC 601-1-2 (EMC Collateral Standard), and of Medical Device Directive 93/42/EEC and with the requirements of Council Directive 89/336/EEC related to Electromagnetic compatibility do NOT apply. Please verify the existence of this symbol by observing a label affixed to the ventilator rear panel.

## Warranty

The 7200 Ventilator System is warranted against defects in material and workmanship in accordance with Nellcor Puritan Bennett Medical Equipment Warranty for 2 years from the time of sale. To ensure the validity of the warranty, be sure to keep a maintenance record.

## Symbols



Power Switch Positions. **I** represents the ON position, **⦿** represents the OFF position. This switches main power on and off to the ventilator.



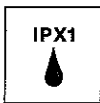
Refer to documentation for information.



Type B equipment per IEC 601-1.



Potential equalization point (ground). Provides a means of connection between the equipment and the potential equalization bussbar of the electrical connection. A common grounding point for the whole ventilator.



Indicates the degree of protection provided by the enclosure (drip proof).



Fire hazard. Keep all sources of ignition away from this device.



Explosion hazard. Do not use near flammable anesthetics.



Electric shock hazard. Do not open unit. Refer servicing to qualified personnel.



Signifies compliance with the Medical Device Directive, 93/42/EEC.



Signifies approval by the Canadian Standards Association.



Serial Number. The year of manufacture is determined by the first two numbers.

## Changes to specific pages in the existing manual

- P 1-4** Number of days which battery will sustain memory is revised  
**FROM:** MINIMUM of 200 days  
**TO:** MAXIMUM of 200 days
- P 2-10** Respiratory Rate is changed  
**FROM:** 10 breaths  
**TO:** 8 breaths
- P 2-22** Figure 2-16. A warning is added:

### Warning

Nothing which would restrict or prevent gas delivery to the patient should be placed into, or at, the outlet connector of the exhalation valve.

- P 4-19** Table 4-4. The following parts are no longer available:

Bacteria Filter with Coupling	P/N 4-003790-00
Bacteria Filter	P/N 4-003792-00
Parts List	P/N 4-022125-00
Flex Arm	P/N 4-018182-00

The following flex arm assemblies are available:

Standard Assembly	P/N 4-032006-00
Available in Germany	P/N 4-021574-00

- P 4-21** Table 4-5. The following parts are no longer available:

Humidifier Temperature Alarm	P/N 4-007900-00
Cascade II Humidifier	P/N 4-009366-00
Oxygen Monitor Kit	P/N 4-019715-00

The Oxygen Monitor Kit has been replaced by:

MiniOX 3000 Kit	P/N 4-023394-00
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Kits available for use with the MiniOX 3000 include:

Bracket Kit	P/N 4-023412-00
Ventilator Mounting Bracket Kit	P/N 4-023413-00

- Glossary 2** Definition for APNEA changes

**FROM:** The ventilator will recognize apnea as a gas flow less than 50 ml through the exhalation flow sensor.

**TO:** The ventilator will recognize apnea as a gas flow less than 5 ml through the exhalation flow sensor.

Comparison of this flow to 10% of tidal volume as a means of detecting apnea should also be deleted.

- Glossary 5** Definition of Exhalation Valve Leak changes

**FROM:** gas flow greater than 10% of delivered volume or 50 ml past the *expiration valve* during inspiration will activate the alarm indicator.

**TO:** gas flow greater than 10% of delivered volume or 50 ml past the *exhalation valve* during inspiration will activate the alarm indicator

## Physical characteristics and environmental requirements

**Table A3-1: 7200 Ventilatory System physical characteristics: Dimensions**

Component	Height cm (in)		Width cm (in)		Depth cm (in)	
Ventilator, stand-alone	42	(16.5)	56	(22.0)	57	(22.5)
Ventilator with pedestal or compressor pedestal	104	(41.0)	56	(22.0)	66	(26.0)
Ventilator with cart	103	(40.7)	58	(23.5)	61	(24.0)
Compressor pedestal or ventilator pedestal	62	(24.5)	53	(21.0)	61	(24.0)
Ventilator cart	61	(24.2)	58	(22.8)	61	(24.0)

**Table A3-2: 7200 Ventilatory System physical characteristics: Weight**

Component	Assembly kg (lb)		Shipping kg (lb)	
Ventilator, stand-alone	65	(145)	84	(185)
Ventilator with compressor pedestal	128	(285)	146*	(320)
Ventilator with pedestal	109	(243)	127*	(280)
Ventilator with cart	98	(215)	111	(245)
Compressor pedestal	63	(140)	92*	(202)
Ventilator pedestal	44	(98)	68	(150)
Ventilator cart	32	(70)	48	(105)

\* Assumes inclusion of accessory box with operations manual and miscellaneous items.

**Table A3-3: 7200 Ventilatory System environmental requirements**

<b>Environmental Temperature</b> Operating Storage/Shipping	10 to 40°C (50 to 104°F) -34 to 70°C (-29 to 158°F)
<b>Relative Humidity</b> Operating Storage/Shipping	15 to 95%, noncondensing 0 to 95%, noncondensing
<b>Clearance for air circulation</b> On all vertical sides	15.0 cm (6.0 in.) minimum
<b>Storage Requirements</b> Short-term (200 days or less) Long-term (over 200 days)	None Remove batteries
<b>Maximum Altitude</b> Operating Storage/Shipping	3,048 m (10,000 ft.) 15,240 m (50,000 ft.)
<b>Electrostatic Discharge (ESD)</b> Shielding/protection	See Section 8 in the 7200 Service Manual



## Airway pressure wave form

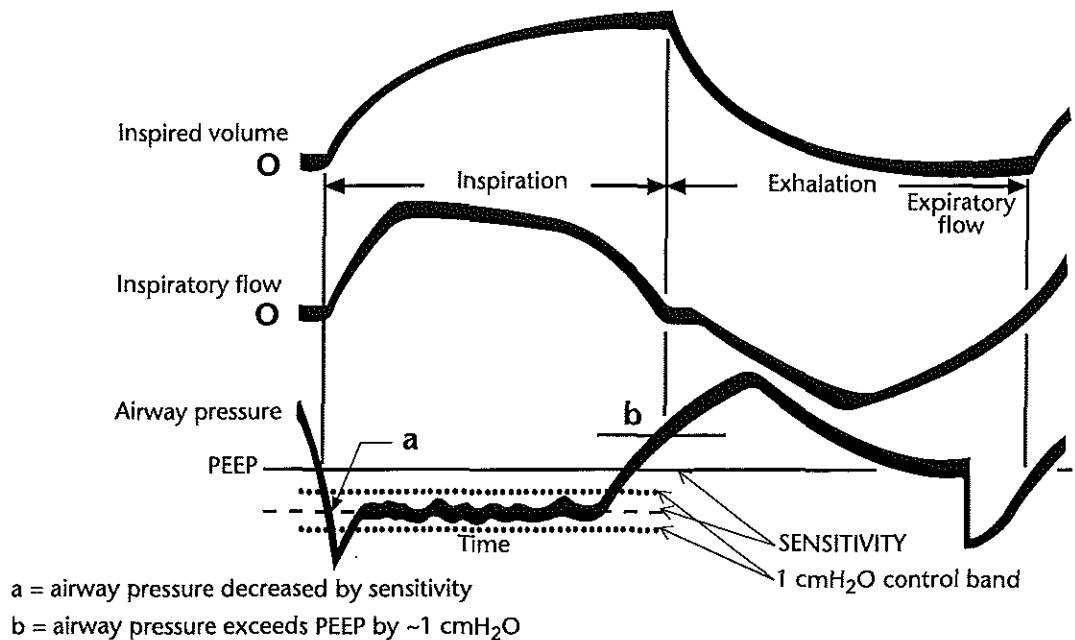


Figure 1.0 Pressure, flow, and volume during a spontaneous breath

## Use of breathing circuits with heated wires

### Caution

Heated wires in the exhalation limb of the breathing circuit can, in some circumstances, result in condensation in the exhalation compartment, which can damage the ventilator. If liquid droplets are evident on the exit port of the exhalation valve, the condition exists.

If it is necessary to use breathing circuits with heated wires in the exhalation limb, the following measures may be taken to prevent condensation:

- Increase room temperature.
- Direct air-flow from fans or air conditioners away from the ventilator.
- Reduce the patient proximal and chamber temperature settings.

## Alarm silence during airway pressure disconnect

The <ALARM SILENCE> key is disabled during airway pressure disconnect. If alarm silence is active when airway pressure disconnect is declared, the alarm will sound, and cannot be silenced. Pressing <ALARM RESET> will reset an airway pressure disconnect condition and re-enable the <ALARM SILENCE> key.

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## High pressure limit during apnea ventilation

### Warning

Depending on the operator-selected apnea interval, it is possible for breath stacking to occur when apnea ventilation begins. The apnea interval is the period of time from the start of an exhalation to the start of the next exhalation. If this interval elapses and the exhalation flow sensor has not measured a minimum exhaled volume, the ventilator declares apnea and immediately begins apnea ventilation. If apnea is declared during an inspiratory phase, it is possible for an apnea breath to be stacked onto a portion of a spontaneous or mandatory breath. Be sure to set the apnea interval and High Pressure Limit to a level deemed appropriate for the patient.

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## Patient Service Circuit Warning

The warnings on page 1-2 of the 7200 Series Ventilatory System Operator's Manual and page 1 of the Pressure Control Ventilation (Option 80) Appendix (P/N 4-020576-00) regarding the use of the ventilator on neonates and/or infants should now read:

### Warning

The 7200 Series Ventilator is not designed for use, nor should it be used, with pediatric patient service circuits.

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## Periodic Maintenance Schedule

Please add the following to the 7200 periodic maintenance schedule:

Frequency	Component	Maintenance
Daily	Patient circuit components and filters	<p>Ensure that the ventilator functions normally with the filters and patient circuit components in place. Monitor performance of filters and replace as needed. Measure resistance of reusable filters prior to each reuse and ensure that back pressure does not exceed safe limits. Follow specific maintenance instructions as recommended for each type of filter.</p> <hr/> <p><b>NOTE:</b>                      Nellcor Puritan Bennett recommends the use of the Puritan-Bennett <i>OmniFilter</i>® or SPU Filter or equivalent as the exhalation filter. For the inspiration side (main flow) filter, the <i>OmniFilter</i> or Main Flow filter, or equivalent, is recommended.</p>
Every 2,500 hours	Preventive maintenance kits	<p>Nellcor Puritan Bennett recommends that a qualified service technician perform maintenance after every 2,500 hours of ventilator use. See the 7200 Operations Manual, Section 4, for more complete instructions.</p> <hr/> <p><b>NOTE:</b>                      Because the ventilator and compressor can accrue hours separately, be sure to confirm the elapsed time for each. To view operational hours, press the &lt;MORE SCREENS&gt; button on the upper screen, then select the &lt;OPERATIONAL TIME&gt; subscreen.</p>
Yearly	Ventilator inspection	<p>Inspect the ventilator exterior for evidence of mechanical damage and for label illegibility. If damage or label illegibility is noted, have a qualified service technician service the ventilator.</p>

ADDENDUM

# 7200 Series Ventilatory System Keyboards

Three keyboards are available on different models of the 7200. The Basic and Enhanced keyboards may be found on older models of the 7200 and may still be repaired. The Enhanced-Plus keyboard was introduced in 1993 and is now the standard keyboard supplied with 7200 Series ventilators. This document will compare the three keyboards, with emphasis on the Enhanced-Plus keyboard.

## 1.1 General Keyboard Functions

The keyboard allows the operator to specify how the ventilator delivers breaths, using specified keys and the knob used to set PEEP, as well as displays and indicator lights which report patient data, ventilator status, and alarms.

Each keyboard (Basic, Enhanced, and Enhanced-Plus) has three functional areas:

The **PATIENT DATA** section provides information on breath types, pressures, volumes, rates and I:E ratios.

The **VENTILATOR SETTINGS** section is used by the operator to select ventilator settings. As settings are selected, the values are displayed in the message window. The operator can also view the following in their respective digital displays:

- tidal volume
- respiratory rate
- peak inspiratory flow
- oxygen percentage

In addition, special functions may be selected with the following keys:

- <MANUAL INSPIRATION>
- <MANUAL SIGH>
- <AUTOMATIC SIGH>
- <NEBULIZER>
- <100% O<sub>2</sub> SUCTION>

The <+> key, used in conjunction with the numeric keypad, allows access to supplemental functions.

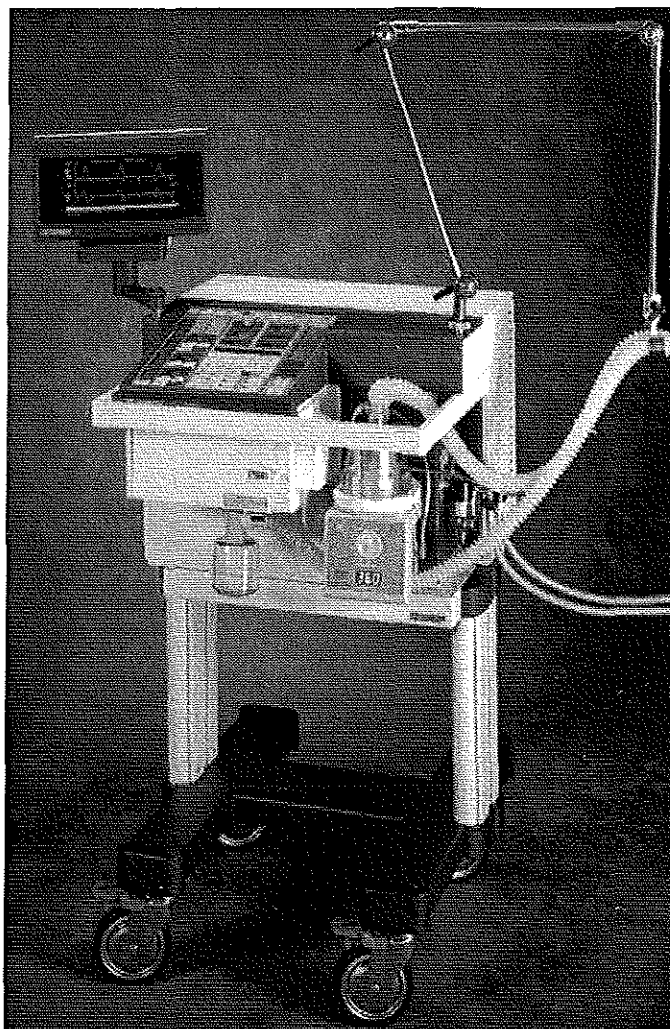
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**NOTE:**

If you have an Enhanced-Plus keyboard, many of the <+> functions may be accessed simply by pressing the labeled keys at the top of the keyboard.

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The **VENTILATOR STATUS** section contains 12 specific alarm indicators and six general status displays. These indicators and displays notify the operator of alarm conditions and emergency ventilation modes.



**Figure 1-1. 7200 Ventilator with Enhanced-Plus Keyboard**

### 1.1.1 Basic Keyboard

The Basic keyboard (Figure 1-2) is charcoal gray, with colored borders separating the Patient Data, Ventilator Settings, and Ventilator Status areas. Patient Data information occupies the top half of the keyboard, Ventilator Settings is at the lower right, and Ventilator Status is at the lower left. Two keys beneath the analog meter (upper left corner) allow the operator to choose whether the meter measures airway pressure or exhaled volume.

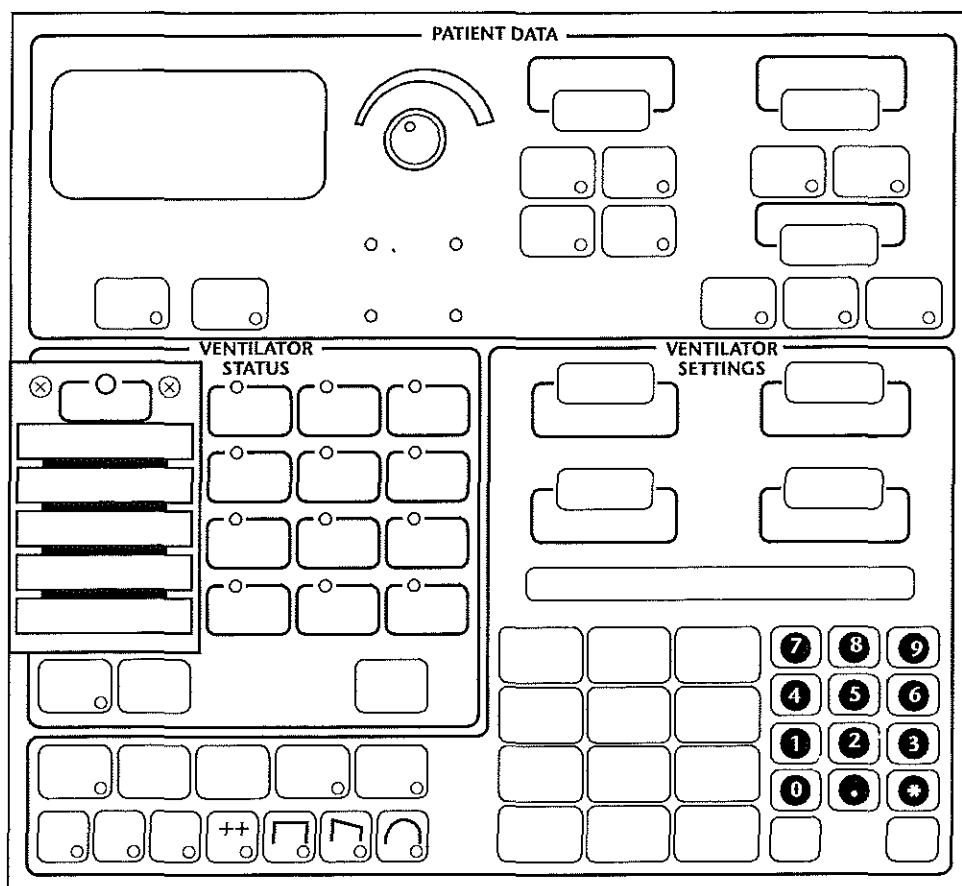


Figure 1-2. Basic Keyboard

### 1.1.2 Enhanced Keyboard

The Enhanced keyboard (Figure 1-3) is color coded, with the three information sections arranged vertically. The PATIENT DATA section (green) occupies the left side of the keyboard. The VENTILATOR SETTINGS section (blue) is in the center. The VENTILATOR STATUS section (gray) is on the right side. The analog meter in the Enhanced Keyboard shows only airway pressure; the operator cannot toggle between displaying airway pressure or exhaled volume.

Other differences between the Basic and Enhanced keyboards are:

- The indicator light on the <ALARM SILENCE> key is red in the Basic keyboard and yellow in the Enhanced.
- The NORMAL indicator in the alarm summary display is blue in the Basic keyboard and green in the Enhanced.
- The alarm summary display is illuminated by lamps in the Basic keyboard and LED's in the Enhanced. The LED's do not require periodic replacement as do the lamps.

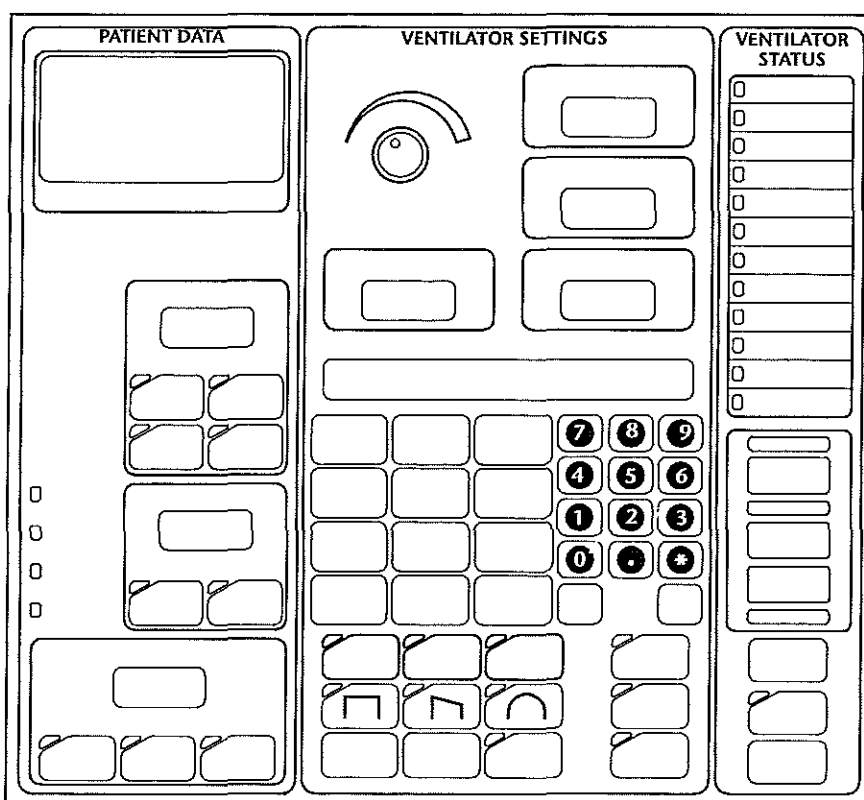


Figure 1-3. Enhanced Keyboard



### 1.1.3 Enhanced-Plus Keyboard

The Enhanced-Plus keyboard (Figure 1-4) uses the same vertical arrangement and color coding as the Enhanced keyboard, but offers the following advantages:

- The analog meter has been replaced with a dual-scale vertical bar graph that displays airway pressure. The bar graph can register values between -10 and +60 cmH<sub>2</sub>O or between -20 and +120 cmH<sub>2</sub>O. Press the <PRESSURE SCALE> key to toggle between the two ranges.
- A new row of keys at the top of the keyboard allows direct access to software-controlled options, rather than using the <++> key (the <++> key may still be used; this new row of keys merely provides a short cut). The new keys allow the operator to see, at a glance, which options are installed. Unlabeled keys are reserved for additional options; as new options are installed, the keys will be labelled. In addition, when the ventilator is in use, LED's in the upper left corner of most option keys indicate which options are active.
- Four of the keys on the numeric keypad have directional arrows. These are used with the Graphics 2.0 option.
- The PEEP/CPAP settings window has been moved from the Patient Data Section (Enhanced keyboard) to the Ventilator Settings section. The window is now directly below the PEEP/CPAP knob.

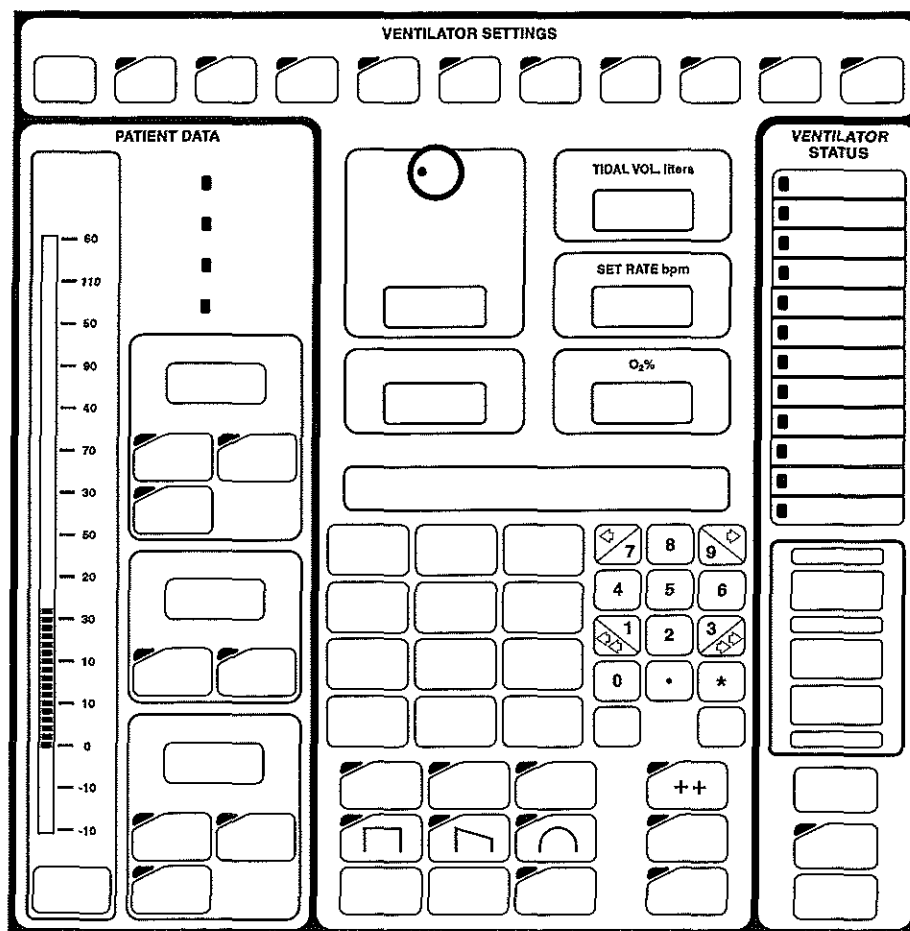


Figure 1-4. Enhanced-Plus Keyboard

### 1.1.3.1 Dual-Scale Bar Graph Features

Like the analog meters in previous keyboards, the dual-scale bar graph measures airway pressure. An LED at the zero point is always lit, and LED's above or below zero indicate positive or negative airway pressure, respectively.

The <PRESSURE SCALE> key allows the operator to select a low-pressure scale (-10 to +60 cmH<sub>2</sub>O, with each LED = 1 cmH<sub>2</sub>O), or a high-pressure scale (-20 to +120 cmH<sub>2</sub>O, with each LED = 2 cmH<sub>2</sub>O).

In the low pressure scale, at a pressure of 5 cmH<sub>2</sub>O, six LED's will be lit, representing a reading from 0 to 5 cmH<sub>2</sub>O. When pressure increases to 6 cmH<sub>2</sub>O, seven LED's will be lit, representing 0 to 6 cmH<sub>2</sub>O.

In the high pressure scale, at a pressure of 5 cmH<sub>2</sub>O, three LED's will be lit, representing a reading from 0 to 5 cmH<sub>2</sub>O. When pressure increases to 6 cmH<sub>2</sub>O, four LED's will be lit, representing 0 to 6 cmH<sub>2</sub>O.

#### NOTE:

When changing PEEP, the low-pressure scale may be easier to use because of the one-to-one ratio.

In addition to its dual-scale capability, the bar graph on the Enhanced-Plus keyboard shows peak and end inspiratory pressures. When exhalation begins for a volume-based mandatory breath, an LED marks the peak inspiratory pressure. The LED remains lit until the next inspiration begins. Similarly, when an exhalation begins for a pressure-controlled breath, an LED marks the end inspiratory pressure and remains lit until the next inspiration begins. The bar graph also shows when the patient airway pressure of any breath exceeds the maximum pressure on the selected scale. The top three LED's illuminate and flash for the remainder of that breath.

Table 1-1, below, summarizes the features of each keyboard.

**Table 1-1: Keyboard Comparisons**

Feature/Area	Basic	Enhanced	Enhanced-Plus
Patient Data	Top of keyboard	Left side, green background	Left side, green background
Ventilator Settings	Lower right	Center, blue background	Center, blue background
Ventilator Status	Lower left	Right side, gray background	Right side, gray background
Meter	Analog, toggle between airway pressure and exhaled volume.	Analog, airway pressure only	Dual-scale bar graph, airway pressure only.
PEEP/CPAP Settings Window	Right of PEEP/CPAP knob in Patient Data section	Beneath airway pressure meter in Patient Data Section	Beneath PEEP/CPAP knob in Ventilator Settings section
Alarm Summary Display	Illuminated by lamps	Illuminated by LED's	Illuminated by LED's
General Indicator Lights	Red	Green	Green
ALARM SILENCE Indicator	Red lamp	Yellow LED	Yellow LED
NORMAL Indicator	Blue lamp	Green LED	Green LED
<+> Functions	Access via <+> key and numeric keypad	Access via <+> key and numeric keypad	Access via <+> key and numeric keypad, or via option keys at top of keyboard.

## Installing the *MiniOX 3000* Oxygen Monitor

Install the *MiniOX 3000* Oxygen monitor to the 7200 using bracket kit P/N 4-023413, as follows. Refer to Figure 2-1.

1. Locate one of the threaded sockets on the top of the 7200 (either on the right or left side).
2. If installed, remove flex arm, universal bottle hanger, or 7202 Display from its threaded mounting hole on ventilator.
3. Install mounting bracket into threaded socket on the ventilator.
4. Slide *MiniOX* into the mounting bracket as shown.
5. Reinstall accessories removed in step 1 into the threaded nut on the bracket arm.

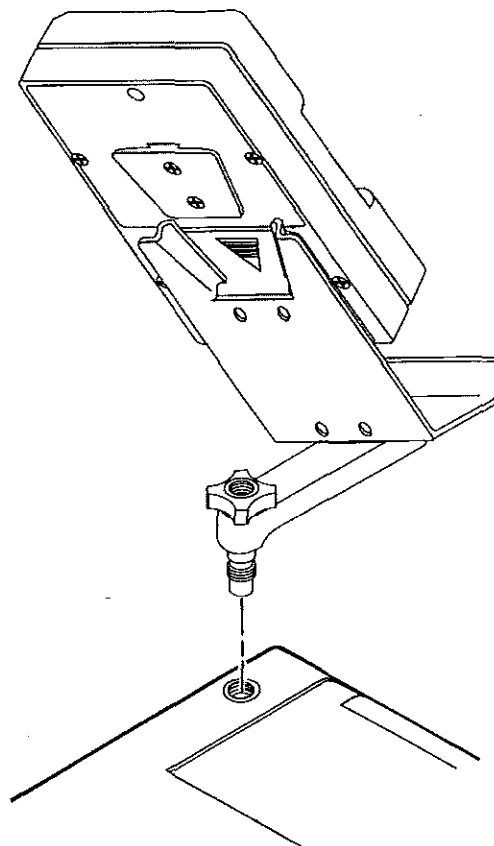


Figure 2-1. Installing the *MiniOX 3000* Oxygen Monitor



# Additional Upgrades

In addition to the Enhanced-Plus keyboard, which is now standard on all new 7200 Series Ventilators and is fully described in Section 1, the following upgrades are available for the 7200 Enhanced Series Ventilator

- AC Power Fail Alarm Test
- Software upgrades
- *Flow-by*<sup>TM</sup> 2.0 (Option 50)
- Graphics 2.0 (Option 60) and Parameter Averaging
- Nebulization upgrades
- Digital Communications Interface (DCI) 2.0 (Option 20)
- Inspiratory Time During Pressure Control Ventilation (Option 80)
- Host communications
- Operator time-out
- I:E Ratio Display upgrades
- Scrolling messages for active options

## 3.1 AC Power Fail Alarm Test

Total Extended Self Test (TEST) now includes a check for ac power fail alarm at the end of TEST. Disconnect the AC power cord when [TEST AC ALARM] appears in the 20-character display or the 7202 Display, then verify that an audible alarm sounds. To bypass this test, press <CLEAR>.

If the AC power alarm sounds, reconnect the power cord to the wall outlet. The ventilator will prompt for a check of apnea parameters, and then begin normal operation. If no audible alarm sounds when the AC power is disconnected, service the ventilator.

## 3.2 Software Upgrades

The software in the 7200 Enhanced Series Ventilator has been upgraded to provide the most current improvements.

To check the software revision on the ventilator, press <LAMP TEST>, then <ENTER>. The software part number is displayed as follows:

eee 26300-85-x zzz

or

eee 24300-85-x zzz

where "x" is the software revision level, "eee" is the two- or three-character code for the ventilator model, and "zzz" is the code for installed options.

### 3.3 New Functions: Patient Data and Auto-PEEP

Patient Data (Function 3) replaces Function 20 and Function 63, and allows the operator to enter or change the patient ID and room number, even if the Graphics or DCI options are not installed. Auto-PEEP (Function 4) allows measurement of Auto-PEEP and total PEEP.

#### 3.3.1 Patient Data (Function 3)

Function 3 enters or changes the patient ID or room number appearing on DCI reports. The patient ID field is 13 digits long; the room number field is 4 digits long. The default values are all zeroes for both parameters. Table 3-1 illustrates the steps to set or change Function 3.

**NOTE:**

Changing the patient ID erases all current Trending (Function 61) and chart summary (Function 24) data. Changing *only* the room number does not erase data.

**Table 3-1: Patient Data Procedure**

Operator Action	Message Display Window	Comments
Select Function 3.	[3 PATIENT DATA]	Press <ENTER> to view or set patient ID and room number, or press <CLEAR> to use default value.
To select default values, press <CLEAR>.	[DEFAULT VALUES-ENTER]	Press <ENTER> to use default values for Function 3.
To specify patient ID or room number, press <ENTER>.	[PATIENT ID XXXXXXXXXXXXX]	X's represent current patient ID. To change, key in up to 13 digits. If less than 13 digits are being used, leading zeroes are not required.
Key in a new patient ID number and press <ENTER>, or leave as is.	[PATIENT ID YYYYYYYYYYYY]	Y's represent the new patient ID. If a patient ID has already been entered, the ventilator displays [NEW PATIENT-ENTER]. Press <ENTER> to confirm that you want to enter a new patient ID. If the ventilator has already recorded patient data under a different patient ID, the display will read [ERASE PT DATA-ENTER]. Press <ENTER> to confirm that you want to record patient data under the new patient ID.
Press <ENTER>.	[ROOM NUM XXXX]	X's represent the current room number.
Key in a new room number and press <ENTER> or leave as is.	[ROOM NUM YYYY]	Y's represent the new room number. To change the room number, key in up to 4 digits (leading zeroes are not required).
Press <ENTER>.	[UPDATE PARAMS-ENTER]	Press <ENTER> for the ventilator to accept the new data. To cancel the new values, press <CLEAR>.

### 3.3.2 Auto-PEEP (Function 4)

The Auto-PEEP maneuver is a standard feature on every 7200 Enhanced Series Ventilator, (including the 7200ae, 7200spe, and 7200e). Auto-PEEP is a software feature; no hardware changes are required.

Auto-PEEP is the positive end expiratory pressure (PEEP), or alveolar pressure, at the end of an exhalation. It is also known as:

- intrinsic PEEP
- inherent PEEP
- occult PEEP
- endogenous PEEP
- pulmonary gas trapping

Auto-PEEP results when a ventilator delivers a breath before the patient has had time to completely exhale the previous breath. Common causes include premature airway closure, or inadequate expiratory time. Auto-PEEP is an important measurement in inverse ratio ventilation (IRV), where short expiration times can cause pressure to be trapped in the alveoli. Pressure control inverse ratio ventilation (PCIRV) is available on the 7200 Series Ventilator, using Pressure Control Ventilation (Option 80). Auto-PEEP is likely to increase if minute ventilation, respiratory rate, or the I:E ratio are increased.

Figure 3-1 shows how Auto-PEEP is measured on the 7200 Enhanced Series Ventilator, and includes these terms:

- *Auto-PEEP*: PEEP calculated at the end of the expiratory pause interval. Auto-PEEP doesn't include extrinsic circuit PEEP.
- *Expiratory pause interval*: an interval at the end of the exhalation phase, immediately preceding a ventilator-initiated mandatory inspiration. During the expiratory pause interval, the exhalation valve, inspiratory valves, and nebulizer solenoids are closed.
- *Extrinsic PEEP*: PEEP that exists in the patient circuit at the end of exhalation, before the expiratory pause interval.
- *Total PEEP*: extrinsic PEEP + Auto-PEEP.

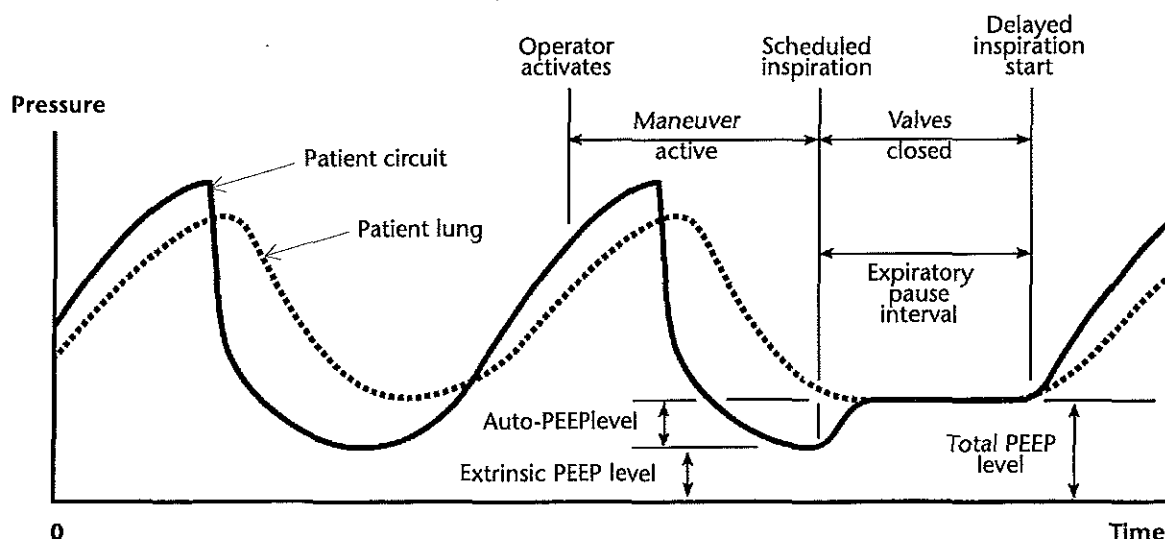


Figure 3-1. Auto-PEEP on the Enhanced 7200 Series Ventilatory System

The ventilator measures extrinsic PEEP just before the operator-selected expiratory pause interval begins. At the end of the expiratory pause interval, the ventilator measures total PEEP. The ventilator then calculates Auto-PEEP by subtracting extrinsic PEEP from the total PEEP.

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**NOTE:**

Extrinsic PEEP is the PEEP measured in the patient circuit at end exhalation. Since extrinsic PEEP is actual measured pressure, in some situations it may vary slightly from the digital PEEP setting.

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### 3.3.3 Using Auto-PEEP (Function 4)

The expiratory pause interval in the Auto-PEEP maneuver is operator-set. An expiratory pause of 0.5 to 20 seconds may be entered. The optimum length of the interval should be the time required to reach a steady airway pressure.

---

**NOTE:**

When setting the expiratory pause time, Nellcor Puritan Bennett suggests beginning with the default (2 seconds). While various patient lung conditions may require different expiratory pause times, 2 seconds is often adequate. Determine whether airway pressure has reached a steady state by consulting the analog pressure display on the ventilator, or pressure waveforms on the 7202 Display, using Graphics 2.0 (Option 60).

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Real-time control of the expiratory pause is possible by using the <ENTER> key. If, during an Auto-PEEP maneuver, it is evident that the airway pressure has reached a steady state before the set expiration interval has elapsed, the maneuver may be terminated manually. To terminate the maneuver and obtain valid Auto-PEEP and total PEEP values, press <ENTER> during the message [VALVES NOW CLOSED].

---

**Warning**

No amount of automatic monitoring in the enhanced 7200 Series ventilator can eliminate the need for clinical surveillance. For longer expiratory pause intervals, it is particularly important for the clinician to remain with the patient throughout an Auto-PEEP maneuver to ensure patient safety and the validity of Auto-PEEP calculations.

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**NOTE:**

To terminate the expiratory pause, press <ENTER> while [VALVES NOW CLOSED] is displayed. This causes the actual expiratory pause to be shorter than the set expiratory pause. The ventilator then calculates the values for Auto-PEEP and total PEEP.

---



To begin Auto-PEEP, press <AUTO-PEEP> (on the Enhanced-Plus keyboard) or <++>4 <ENTER>, and follow the steps listed in Table 3-2.

Table 3-2: Auto-PEEP Procedure

Display Window	7202 Display	Comments
[AUTO-PEEP]	[PRESS ENTER TO SELECT: AUTO-PEEP]	Press <ENTER>. If you don't press <ENTER>, this message disappears after a few seconds.
[LAST A-PEEP XX CMH <sub>2</sub> O]	[LAST AUTO-PEEP = xx CMH <sub>2</sub> O AT hhmm, mmm, dd. ENTER TO CONTINUE]	The value of the last Auto-PEEP measurement is displayed. If an Auto-PEEP maneuver hasn't been performed since the ventilator was powered up, the value for Auto-PEEP and timestamp are blank. Press <ENTER>. If you press <CLEAR>, the ventilator returns to the [AUTO-PEEP] message.
[LAST T-PEEP xx CMH <sub>2</sub> O]	[LAST TOTAL PEEP = xx CMH <sub>2</sub> O AT hhmm, mmm, dd. ENTER TO CONTINUE]	The value of the last total PEEP measurement is displayed. If an Auto-PEEP maneuver hasn't been performed since the ventilator was powered up, the value for total PEEP and timestamp are blank. Press <ENTER>. If you press <CLEAR>, the ventilator returns to the [AUTO-PEEP] message.
[EXP PAUSE xxxx SEC]	[CHANGE EXPIRATORY PAUSE FROM xxxx TO xxxx SECS (0.5 to 20 sec)]	Enter a number from 0.5 to 20. The most recently selected value for expiratory pause (default value = 2 seconds) is displayed. If a number outside the specified range is entered, the message [INVALID ENTRY] is displayed. Press <CLEAR> to reenter the expiratory pause.
[BEGIN AP MNVR-ENTER]	[AUTO-PEEP = xx CMH <sub>2</sub> O AT hhmm, mmm dd. TO BEGIN AP MANEUVER- PRESS ENTER]	Press <ENTER> to activate the Auto-PEEP maneuver. If you press <CLEAR> the ventilator returns to the [AUTO-PEEP] message.
[AUTOPEEP MNVR ACTIVE] then [VALVES NOW CLOSED]	[AUTO-PEEP MANEUVER ACTIVE AUTO-PEEP = xx CMH <sub>2</sub> O. TOTAL PEEP = xx CMH <sub>2</sub> O. TO CANCEL, PRESS ANY SETTINGS KEY; TO RESTART, PRESS CLEAR] then [TO CANCEL, PRESS ANY SETTINGS KEY; TO RESTART, PRESS CLEAR. TO SHORTEN PAUSE AND CALCULATE AUTO-PEEP NOW, PRESS ENTER. BOTH THE INSPIRATION AND EXHALATION VALVES ARE CLOSED]	The ventilator performs an Auto-PEEP maneuver at the transition to the next ventilator-initiated mandatory inspiration. Pressing <ENTER> terminates the expiratory pause and calculates Auto-PEEP. Pressing <CLEAR> or the PEEP/CPAP knob cancels the maneuver and the Auto-PEEP calculation. The [EXP PAUSE xx SEC] message is displayed to prompt you to retry the maneuver. Pressing any ventilator settings key cancels the maneuver and the Auto-PEEP calculation, and exits the Auto-PEEP Function.

Table 3-2: Auto-PEEP Procedure (continued)

Display Window	7202 Display	Comments
[AUTO-PEEP = xx CMH <sub>2</sub> O] then [TOTAL PEEP xx CMH <sub>2</sub> O]	[TO RE-RUN MANEUVER, PRESS ENTER. TO EXIT PRESS ANY SETTINGS KEY. AUTO-PEEP = xx CMH <sub>2</sub> O, TOTAL PEEP = xx CMH <sub>2</sub> O AT hhmm, mmm dd. SCREEN IS FROZEN]	The ventilator displays the values for Auto-PEEP and total PEEP until you press any key. Press <ENTER> to return to [EXP PAUSE xx SEC]. The display shows [SCREEN IS FORZEN] if waveforms are displayed during the Auto-PEEP maneuver. To print the waveforms, press <++>62.
[PRINT SCREEN-ENTER]	[TO PRINT THE SCREEN-PRESS ENTER. TO UNFREEZE, PRESS *]	Press <ENTER> to print the frozen waveforms, or press <*> to unfreeze the screen.

In addition to normal Auto-PEEP operation, other messages may appear as described in Table 3-3.

Table 3-3: Additional Auto-PEEP Messages

20-Character Display	7202 Display	Explanation
[INVALID ENTRY]	[INVALID ENTRY-PRESS CLEAR TO REENTER]	A value was entered for expiratory pause which was not within the allowed range of 0.5 to 20 seconds. Press <CLEAR>, then reenter the value for expiratory pause.
[FUNCTION INACTIVE]	[FUNCTION INACTIVE IN CPAP MODE]	An Auto-PEEP maneuver was attempted during CPAP. The ventilator measures Auto-PEEP using ventilator-initiated mandatory breaths only. Auto-PEEP can be performed during CMV, at the transition to a mandatory breath in SIMV, or at the transition to an automatic sigh breath in CMV or SIMV.
[DOWNLOAD IN PROGRESS]	[SCREEN IS FROZEN- DOWNLOAD IN PROGRESS]	Auto-PEEP maneuver was attempted while the ventilator was sending a Graphics 2.0 image to the printer. Downloading a graphic image takes precedence over running a maneuver. Retry the maneuver once the download is complete.

Table 3-3: Additional Auto-PEEP Messages (continued)

20-Character Display	7202 Display	Explanation
[MNVR ABORTED]	[THE AUTO-PEEP MANEUVER HAS BEEN ABORTED]	<p>One of the following has occurred:</p> <ul style="list-style-type: none"> <li>• A ventilator settings key, &lt;EST&gt;, &lt;LAMP TEST&gt;, or &lt;CLEAR&gt; was pressed during the maneuver. If &lt;MANUAL INSPIRATION&gt; or &lt;MANUAL SIGH&gt; is pressed, the ventilator will deliver a manual breath.</li> <li>• The ventilator sensed that the patient was trying to take a breath during an Auto-PEEP maneuver.</li> <li>• A high-pressure limit, low inspiratory pressure, or low PEEP/CPAP alarm occurred during the Auto-PEEP maneuver.</li> <li>• A ventilator-initiated mandatory breath is scheduled in SIMV while the ventilator is delivering a spontaneous inspiration.</li> <li>• The apnea, safety valve open, or airway pressure disconnect alarm is active. When these alarms are active, the maneuver is cancelled and the ventilator will not prompt for reentry of the expiratory pause.</li> </ul>
	<p><b>NOTE:</b></p> <p>If the message [VALVES NOW CLOSED] was displayed when the maneuver aborted, the pending breath will be delivered immediately (unless the safety valve open alarm is active). If the operator presses &lt;CLEAR&gt;, the 20-character display window will return to the [EXP PAUSE xx SEC] message. Pressing &lt;CLEAR&gt; allows immediate restarting of the Auto-PEEP maneuver without having to repeat the entire sequence. Otherwise, press &lt;+&gt;4 to retry the Auto-PEEP maneuver.</p>	
[EXP PAUSE xxxx SEC]	[CHANGE EXPIRATORY PAUSE FROM xxxx TO xxxx SECS (0.5 to 20 sec)]	<p>This message may appear in the course of normal Auto-PEEP execution. However, this message may also appear if a maneuver is initiated and then postponed for any of the following reasons:</p> <ul style="list-style-type: none"> <li>• The operator pressed &lt;CLEAR&gt;.</li> <li>• An operator-initiated mandatory breath was delivered.</li> <li>• The ventilator sensed patient inspiratory effort.</li> <li>• A ventilator-initiated breath interrupted a patient-initiated breath.</li> </ul> <p>This message may also appear if one of the following alarms becomes active during the maneuver:</p> <ul style="list-style-type: none"> <li>• High pressure limit</li> <li>• Low inspiration pressure</li> <li>• Low PEEP/CPAP pressure</li> </ul>

### 3.3.4 Troubleshooting

Occasionally, the calculated value for Auto-PEEP can be underestimated or overestimated, or the expiratory pause interval setting may be longer or shorter than optimum. Table 3-4 lists indicators of possible discrepancies, possible causes, and how to resolve them.

**Table 3-4: Possible problems with Auto-PEEP**

Symptom	Possible Causes	Resolution
Instead of reaching a stable plateau during the expiratory phase interval, airway pressure (as observed on the analog meter or the waveforms) initially rises, then decreases. Auto-PEEP is underestimated--that is, the pressure in the patient's lungs at the end of exhalation is actually higher than the displayed Auto-PEEP value.	There is a leak in the patient circuit OR The patient is attempting to trigger a breath.	Check for leaks in the patient circuit. OR Check to see if the patient is actively breathing.
Airway pressure (as observed on the pressure display) is increasing at the end of the expiratory pause interval, rather than reaching a stable plateau.	Expiratory pause interval setting is too short. This causes the Auto-PEEP value to be underestimated--that is, the pressure in the patient's lungs at the end of exhalation is actually higher than the displayed Auto-PEEP value.	Increase the expiratory pause interval to a value that allows the airway pressure to reach a steady state by the end of the interval.
	Patient is coughing, splinting, or experiencing other diaphragmatic activity. This causes the Auto-PEEP value to be overestimated, which means that the actual pressure in the patient's lungs at the end of exhalation is lower than expected.	Observe the patient for coughing, splinting, or other diaphragmatic activity.
The patient triggers a breath before the set expiratory pause interval has elapsed.	Expiratory pause interval setting is too long.	Decrease the expiratory pause setting, or manually terminate the Auto-PEEP maneuver by pressing <ENTER> during the [VALVES NOW CLOSED] message. To cancel the maneuver at any time, press <CLEAR> or any ventilator settings key. Because pressure sensitivity is active during the expiratory pause interval, a patient who is capable of triggering a breath can terminate the maneuver by making an inspiratory effort.

#### Warning

All systems that estimate Auto-PEEP by allowing lung and patient circuit pressures to equilibrate during an expiratory-hold procedure do not take into account the effect of patient circuit compliance. If pressure in the circuit is less than the patient's lung pressure, the resulting Auto-PEEP value will be lower than the actual end lung pressure. This underestimation is most pronounced in cases where the circuit compliance volume is large relative to the patient lung volume.

**Warning**

The Auto-PEEP and total PEEP measurements require pressure to equilibrate between the patient and the patient circuit. To avoid obstructions that could prevent full pressure equilibration, drain excess condensate from the patient circuit before running an Auto-PEEP maneuver.

**Warning**

To prevent erroneous Auto-PEEP and total PEEP measurements, don't use an externally-powered gas source to drive a nebulizer in the patient circuit.

### 3.3.5 Auto-PEEP and DCI (Option 20)

Auto-PEEP appears in Digital Communications Interface (DCI) reports as follows:

- *Data log and chart summary reports:* when an Auto-PEEP maneuver is completed, total PEEP, Auto-PEEP, and *actual* expiratory pause intervals are printed.
- *Ventilator Status Report:* total PEEP and Auto-PEEP are included.
- *Host Reports:* the Auto-PEEP, total PEEP, actual expiratory pause interval, and time the maneuver was performed are added to the responses to the SNDC and SLMT commands.

### 3.3.6 Auto-PEEP and Graphics (Option 60)

Auto-PEEP affects Graphics (both version 1.0 and 2.0) as follows:

- *Waveforms (Function 60):* if you are displaying waveforms when you activate an Auto-PEEP maneuver, the waveform trace will freeze when the maneuver is done and the screen will not be refreshed.
- *Trending (Function 61):* Auto-PEEP is a selectable parameter for trending, and is one of the default parameters. Total PEEP is a selectable parameter for trending, but is not a default parameter. Once Auto-PEEP or total PEEP is selected for trending, its value is stored whether or not an Auto-PEEP maneuver has been performed. If a maneuver has not been performed, its value is 0.
- *Freeze/Print (Function 62):* waveforms of Auto-PEEP maneuvers are frozen when full traces are plotted. If the freeze/print Function is used when an Auto-PEEP maneuver waveform is displayed, the values for total PEEP, Auto-PEEP, and expiratory pause appear just above the "NOTES" section of the printout.

## 3.4 Graphics 2.0 (Option 60) and Parameter Averaging

With the release of Graphics 2.0 (whether or not the option is installed), measured respiratory rate is based on an 8-breath running average, rather than a 10-breath running average. This change is intended to make the respiratory rate parameter consistent with other parameters that are based on an 8-breath running average.

### 3.5 Nebulization

When the nebulizer is turned on, there may be a short delay before nebulization begins. This allows the ventilator time to ensure accurate O<sub>2</sub>%.

*Flow-by* 2.0 is turned off during nebulization, and must be turned back on again to resume flow triggering after nebulization. The 20-character message window will display a message prompting the operator to resume *Flow-by* following nebulization, if desired.

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**NOTE:**

*Flow-by* 1.0 does not automatically turn off the nebulizer, and therefore must be turned off before the nebulizer can be activated.

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### 3.6 Digital Communications Interface (DCI) (Option 20)

Data from the 7250™ Metabolic Monitor is now printed on the DCI ventilator status report. Blood gas monitoring data is no longer available. The fourth interface port on the back of the ventilator is now used for communication with the 7250. For more information, please see the *DCI 2.0 Appendix* (4-022420-00).

For all DCI reports that include ventilator settings, an asterisk (\*) indicates an option that is on but currently suspended. For example, if pressure support is nonzero, an asterisk will appear next to the pressure support setting when the selected ventilatory mode is CMV.

### 3.7 Inspiratory Time During Pressure Control Ventilation (Option 80)

If Pressure Control Ventilation (Option 80) is installed in the ventilator, inspiratory time can be set from 0.20 to 9.90 seconds (instead of 0.20 to 5.00 seconds), providing that the resulting I:E ratio does not exceed 4:1. This information appears in the option's appendix (4-020576-00), in Tables 1, 3, and 4.

### 3.8 Host Communications

For software shipped or upgraded since May 1992, the 7200 Series ventilator will support RS232 communications with a host system, regardless of options installed. This means that the ventilator can communicate with various bedside monitors or with the *CliniVision*® Hand Held Computer.

### 3.9 Detecting Low Inspiratory Pressure in SIMV

The following warning applies to the Alarms section in Chapter 2 and Table 3-2 in Chapter 3 of the *7200 Series Ventilatory System Operator's Manual*.

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**Warning**

Autocycling in SIMV may not activate the Low Inspiratory Pressure Alarm if patient tubing is disconnected. Ensure that other alarms, especially High Respiratory Rate, Low PEEP/CPAP Pressure, and Low Exhaled Minute Volume, are set properly to detect low inspiratory pressure or disconnected tubing conditions.

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### 3.10 Operator Timeout

The operator timeout has been increased from 18 to 30 seconds. The timeout is the time allowed for the operator to respond to a prompt during normal ventilator operation. The one-minute timeout during Extended Self-Test remains unchanged.

### 3.11 I:E Ratio Displays

- For noninverse ratios, the 7202 Display value now matches the I:E RATIO digital display on the keyboard, which is "1:x".
- For inverse ratios, the 7202 Display now shows "x:1" on the PATIENT DATA screen. The keyboard will continue to display "1:x". For example:

7202 Display	Keyboard
[2.0:1]	[1:0.5]

### 3.12 Scrolling Messages for Active Options

Scrolling messages have been added to indicate which options are active. The messages appear in the 20-character message display window in the keyboard, and on the 7202 Display. Each message appears for 2 seconds, and then scrolls to the next.

When <ENTER> is pressed, the scrolling messages freeze on the pulse oximeter message. Press <ENTER> or <ALARM RESET> to unfreeze.

When any settings key is pressed, the scrolling messages resume after a 30-second timeout, or when <ALARM RESET> is pressed.

The messages stop if an alarm occurs and do not resume until the alarm condition is corrected. Table 3-5 lists messages displayed with each active option, in order of priority.

**Table 3-5: Scrolling Messages**

Option	Message Display Window	7202 Display
Pressure Control Ventilation (Option 80)	[*PRESS CONTROL VENT]	[PRESSURE CONTROL VENTILATION ON]
	[*INSP PRES xx CMH2O]	[I/E RATIO x.xx/x.xx]
	[*INSP TIME x.xx SEC]	(on Ventilator Settings I screen only)
	[*I/E x.xx/x.xx]	
Pressure Support (Option 10)	[PRESS SUPP xx CMH2O]	[PRESSURE SUPPORT ON]
	[PRESS SUPP STAND-BY]*	[PRESSURE SUPPORT IN STAND-BY]*
Flow-by (Option 50)	[FLOW-BY ON]	[FLOW-BY ON]
Pulse Oximetry (Option 90)	[SAT xxx PULSE xxxx]	[SATURATION xxxx PERCENT PULSE RATE xxxx BPM]

\*These messages appear if the level of pressure support during CMV is set or changed. Pressure support is suspended during CMV and becomes active when the ventilation mode switches to SIMV or CPAP.

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Addendum

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